A tragedy of errors:

Covid-19, fallacies, biases, and trust

1. We must do something
2. This is something
3. Therefore, we must do this.

~ *Politician's syllogism*

If a moron says it, it can't be true.

~ *Ad hominem fallacy*

If everyone around you is jumping off a cliff,
it is always epistemically responsible to ask
whether there are any other cliffs to jump off of.

~ Bianco Luno, the thoughtful lemming

Under the circumstances, is the decision to press the notion of social distance to the point of social and economic lockdown the most rational of available options? Are political leaders and the medical experts who advise them correct in their assessment that the goal of this strategy—"to flatten the curve"[1]—will lead to the least amount of harm for all concerned in the effort to constrain the lethality of the Covid-19 outbreak? All things considered? Were all things considered? Are there other strategies? And, if so, how was the decision made in favor of this one?

We appreciate that the decision to use untargeted social distancing and the consequent global lockdown to address a genuine and grave threat was made in good faith, and that it was made in emergency conditions under duress, and that, because of the novelty of the virus, there was a lack of information and preparation. Nevertheless, there are reasons to think it is not obvious that this strategy, the dominant one on the world scene, as it turns out, was the best we could do.

Click here for an interactive map.

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[1] "[T]he idea of slowing a virus's spread so that fewer people need to seek treatment at any given time is known as 'flattening the curve'." Livescience.

Part 1 of the topic will explore the decision from the perspective of philosophy of science, epistemology, and logic. A future second part will approach it from the standpoints of ethics, philosophy of law, social, and political philosophy. It is a massively complicated topic that deserves consideration from *at least* all of these angles.

Covid-19: “flattening the curve” or “herd immunity”?

There was—and is[2]—disarray among scientists and “the science” regarding critical features of the SARS-CoV-2 virus and how best to address the disease it causes, Covid-19. Early in the epidemic, there were strikingly different interpretations of the situation given by experts at top medical research institutions, such as Oxford University and Imperial College London, as to both the infectiousness of this virus and the appropriate measures to take in response. The Oxford/Imperial controversy came to a head in mid March and set the tone for how many, though not all, Western countries subsequently responded to this virus. In essence, the scientific debate concerned two incompatible strategies: “flatten the curve” (taken by the U.S., for example) and “herd immunity”[3] (taken to some degree by such countries as Sweden and Mexico).[4] Some countries, such as the U.K., vacillated wildly between the two strategies before settling on the former.

Which is the correct, or least destructive, strategy? We’ll have to wait and see to get a final answer, but there must be some justification, even under uncertainty, for the decision of one over the other.

A fiasco of historic proportions—or are these experts wrong?

1. Stanford Medical School Professor John Ioannadis, a leading authority on biomedical evidence-gathering and author of an article[5] challenging the received response to the virus, in this video interview (graciously) discusses the lack of scientific justification for the measures currently being taken in response to Covid-19. **4/17/20**

[2] Though you might be excused for not having heard of it, so thoroughly has the controversy been suppressed.

[3] “Herd immunity” explained.

[4] On Sweden’s choice. As for Mexico, there is a lot of *unwarranted* criticism of Mexico’s early apparently luke-warm reaction to the pandemic. See David Martinez’s heavily documented Quora piece (in Spanish).

[5] “A fiasco in the making? As the coronavirus pandemic takes hold, we are making decisions without reliable data,” John P.A. Ioannidis, *StatNews*, March 17, 2020

UPDATE: follow up interview with Dr. Ioannadis reviewing new evidence corroborating earlier suggestions that *this virus, SARS-CoV-2, has an infection fatality rate in the range of the seasonal flu.* **6/29/20 UPDATE:** Stuart Ritchie offers a critique of Ioannadis' stance on the infection rate of Covid-19: "There should never be heroes in science. Some scientists make their careers by criticising other's research. But who watches the watchmen?" at *Unherd*. This piece appropriately calls attention to the possibility that Ioannadis's motives are less than pure. That said, there is good reason to assume that all opinions on the correct response are compromised. Somebody will make money no matter the response. Drug manufacturers have an obvious interest in the development of vaccines and treatments, makers of PPE… etc.

2. Biostatistician Dr. Knut Wittkowski, a 35 year veteran of studying viruses and their progression, does the same here (only with less patience). **UPDATE:** Dr. Wittkowski in a followup interview in light of more recent evidence.
3. Video interview with Dr. David L. Katz, the author of the much-debated March 20th *New York Times* op-ed, "Is Our Fight Against the Coronavirus Worse Than the Disease?"
4. Here is a heartfelt open letter to the Chancellor of Germany from Prof. Sucharit Bhakdi, one of the world's most cited epidemiologists and one of the first to speak out.
5. Beside these, ten more expert voices.
6. John Danaher is an Ireland-based philosopher who does interviews with other philosophers who work at the intersection of philosophy, law, science, and technology. He is doing a series of extended interviews with specialists from these fields on Covid-19-related issues. Here he interviews Katherine Furman, an expert on theories of disease and public distrust of science They discuss, from a philosophy of science perspective, issues in the epistemology and ethics surrounding virus responses. (The first half of the podcast interview sets the stage for an informed discussion; the second half focuses on Covid-19.) See also: "Moral responsibility, culpable ignorance and suppressed disagreement," Katherine Furman, *Social Epistemology* (2018), 32 (5). p. 287.
7. From the earliest days, Global Research has timelined the progress of the virus and responses to it. There is a wealth of information pouring in now from all over the world, and "flattening the curve," as a strategy, is not faring well.
8. "Perspectives on the Pandemic - Episode 6: When Dr. Dan Erickson and Dr. Artin Massihi held a press conference on April 22nd about the

results of testing they conducted at their urgent care facilities around Bakersfield, California, the video, uploaded by a local ABC news affiliate, went viral. After reaching five million views, YouTube took it down on the grounds that it "violated community standards." We followed up with the doctors to determine what was so dangerous about their message. What we discovered were reasonable and well-meaning professionals whose voices should be heard.”

9. “Why lockdowns are the wrong policy - Swedish expert Prof. Johan Giesecke.” “That was one of the more extraordinary interviews we have done here at UnHerd. Professor Johan Giesecke, one of the world’s most senior epidemiologists, advisor to the Swedish Government (he hired Anders Tegnell who is currently directing Swedish strategy), the first Chief Scientist of the European Centre for Disease Prevention and Control, and an advisor to the director general of the WHO, lays out with typically Swedish bluntness why he thinks: - UK policy on lockdown and other European countries are not evidence-based - The correct policy is to protect the old and the frail only - This will eventually lead to herd immunity as a “by-product” - The initial UK response, before the “180 degree U-turn”, was better - The Imperial College paper was “not very good” and he has never seen an unpublished paper have so much policy impact - The paper was very much too pessimistic - Any such models are a dubious basis for public policy anyway - The flattening of the curve is due to the most vulnerable dying first as much as the lockdown - The results will eventually be similar for all countries - Covid-19 is a “mild disease” and similar to the flu, and it was the novelty of the disease that scared people. - The actual fatality rate of Covid-19 is the region of 0.1% - At least 50% of the population of both the UK and Sweden will be shown to have already had the disease when mass antibody testing becomes available.”
10. “Nobel prize winning scientist Prof Michael Levitt: lockdown is a ‘huge mistake’” As he is careful to point out, Professor Michael Levitt is not an epidemiologist. He’s Professor of Structural Biology at the Stanford School of Medicine, and winner of the 2013 Nobel Prize for Chemistry for “the development of multiscale models for complex chemical systems.” With a purely statistical perspective, he has been playing close attention to the Covid-19 pandemic since January, when most of us were not even aware of it. He first spoke out in early February, when through analysing the numbers of cases and deaths in Hubei province he predicted with remarkable accuracy that the epidemic in that province would top out at around 3,250 deaths. In this interview with Freddie Sayers, Executive Editor of UnHerd, Professor Levitt explains why he thinks indiscriminate lockdown measures as “a huge mistake,” and advocates a “smart lockdown” policy, focused on more effective measures, focused on protecting elderly people.

Trust: disarray or solidarity?

Behind the uncertainties of strategy, there is a live debate in philosophy of science over whether science earns the trust of the general public best by:

1. being *as transparent* as possible, airing all the messiness and unknowns, and exposing the public to constantly changing policies as new information emerges (since shouldn't the science turn on a dime *if* the data turns on a dime?), or
2. presenting the public with a "united front," expressing confidence that some path is the "right" one, fudgeing "cognitively dissonant" information, or hedging among experts on the assumption that the lay public can't handle nuance, and even if the avowed correctness of the strategy is, strictly speaking, *a lie* because there is no real scientific consensus *among the relevant experts* on what the right strategy should be at this time and won't be for some time to come—that is, until all the evidence is in, which won't be for years... Yet, it is rational to discern patterns even from within the confusion and to comment on them.

The strategy of transparency is confusing. When people don't see agreement among the experts, they start to pick and choose what they want to believe (which, of course, they would do anyway, but the show of disarray offers particularly potent opportunities).

The second, "united front" strategy radiates hope but inspires confidence only in the short run. As more information inevitably leaks, it breeds bitterness and distrust in the lay public, fueling the not insubstantial measure of it already there. The feeling of being manipulated will have long term untoward consequences. When the public finally learns that the experts and the leaders they advise did not really know what they were doing—they chose a strategy randomly and just went with it (no doubt, with the best intentions)—the reputation of science suffers. *Science is an ever self-correcting enterprise.* It needs time to do this. Sadly, our collective psychology is not so patient. This is how fiasco happens.

How will the scientifically-literate face anti-vaxxers (whose actions threaten to reintroduce devastating diseases into the population we thought had been wiped out forever) and their like in the future when it becomes clear that that supposed "evidence-based" medicine is in fact value-laden—especially on such a scale as this? *Or worse, motivated by irrational fear and symptomatic of fallacious thinking that supposedly was educated out of expert authority?* How does the slogan "evidence-based" square with media-aided suppression of dissenting voices *within* the scientific community?

Transparency or paternalism? The problem is that neither path inspires trust. Either way, we are moving into bad times for science.

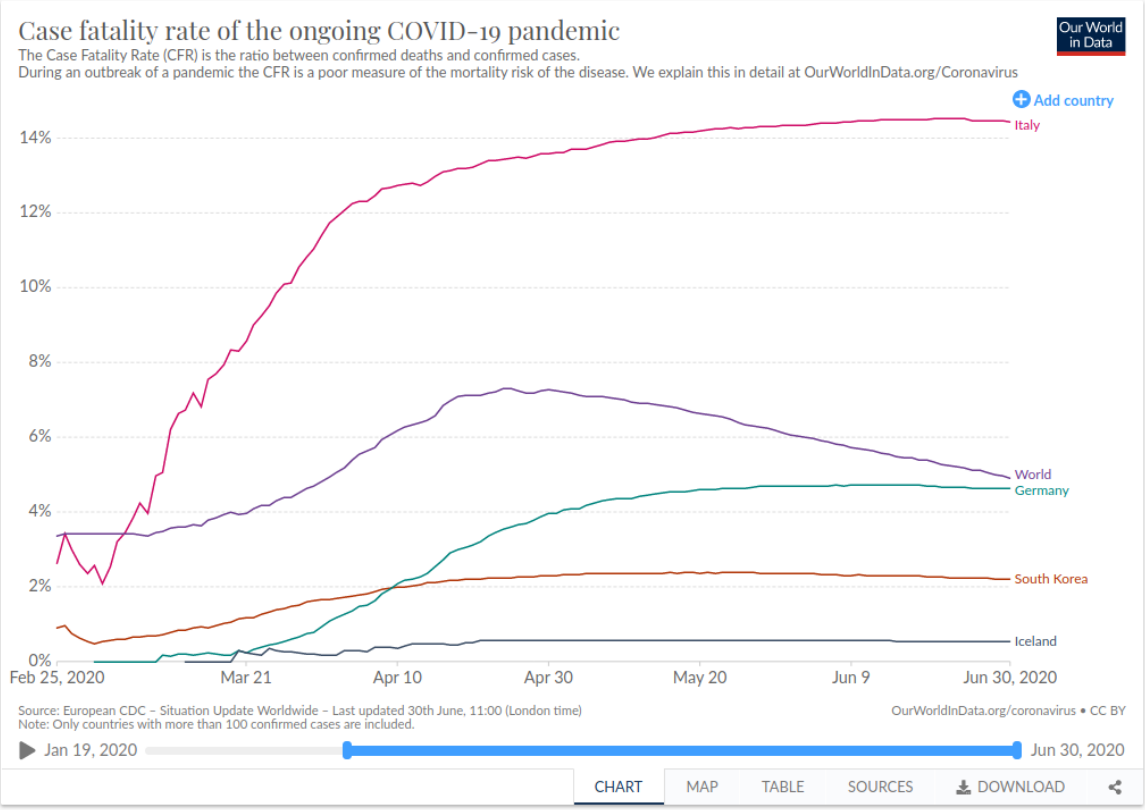
But this concern for the reputation of science is a nicety, and only the tip of the iceberg of the problems entraining the lack of transparency...

We start with biomedical science, and take a close look at case fatality rates (CFR) vs infection fatality rates (IFR), what they tell us, the theory behind "flattening the curve" and "herd immunity," and what we know from the context and history of viruses and the measures taken to cope with them… "We don't have evidence for that.." and "we don't have evidence for this..." *Actually, we have a wealth of evidence. The problem is that the skill of sorting through it is in short supply.*

Later, in a Part 2, we will address social and political consequences of *our reaction* to this "pandemic."

Lethality

The first thing to know about a disease is how serious it is. We are swimming in disease-causing microbes but the vast majority of these agents of illness do not affect us to the point of causing us any discomfort. A few do. Some of these cause discomfort to widely varying degrees. A *very* few viruses lead to death. Almost none of them without help from underlying conditions. Rarely, are these themselves sufficient causes of death on their own. Among viral diseases, Rabies and Ebola would be examples: to be infected without treatment is almost a death sentence in the case of the former, and even with treatment in the case of the latter. But nearly all respiratory disease-causing viruses need comorbid conditions. What we know of Covid-19 indicates it is no different.



Case fatality rate of the ongoing COVID-19 pandemic

The Case Fatality Rate (CFR) is the ratio between confirmed deaths and confirmed cases.
During an outbreak of a pandemic the CFR is a poor measure of the mortality risk of the disease. We explain this in detail at OurWorldInData.org/Coronavirus

Source: European CDC – Situation Update Worldwide – Last updated 30th June, 11:00 (London time)
Note: Only countries with more than 100 confirmed cases are included.

OurWorldInData.org/coronavirus • CC BY

Coronaviruses, in general, and the newly identified virus associated with the Covid-19 disease, in particular, are not by themselves anywhere among the most lethal. The other coronaviruses we know of are associated with the common cold.[6] That is *circumstantial*, not experimental, evidence, true, but it is not correct, as some claim, that we have *no* evidence that SARS-CoV-2 is only as lethal as its more benign cousins. It may be prudent to assume that SARS-CoV-2 may well be more lethal than its cousins, but not that it merits a response “like one we have never seen before” because it is a virus “like one we have never seen before.” In the absence of information to the contrary, it is inductively rational *not* to automatically conclude that merely because it is a new variant that it will end civilization as we know it.

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[6] At the other end of the lethality spectrum are rhinoviruses, one of the major causes of the common cold. See “Can you die from a common cold?” *The Conversation*, December 2019 and “Can you die from a common cold?” *RT Magazine*, February 2020. Known

There is no evidence at this time (April 21, 2020) to indicate that the coronavirus that causes Covid-19, namely, SARS-COV-2, is dramatically more lethal than the viruses that are responsible for the seasonal flu every year. Indeed, there is growing evidence to the contrary. [As of 5/30/20, the case fatality rate is at .6% — six times more lethal than the seasonal flu, and dropping… Early estimates had it at orders of magnitude higher. Update, 6/30/2020:

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Was there such evidence? Yes. In the days shortly after the discovery of the new SARS-COV-2 virus, it’s lethality was calculated to be high enough to suggest that 14% of those infected with the viruses were dying.

Is it likely there *will be* more such evidence? No. That earlier high rate was the result of a “perfect storm” comprised of concentrations of infections in circumscribed regions with long histories of respiratory problems due to very poor air quality (Wuhan and northern Italy) along with other comorbid conditions such as smoking (Italy) or poor medical institutions and all the comorbidities that entrains (the U.S.), along with misstatements and misinterpretation of data, conducing to poor reporting, and everyone caught off guard. Not to mention well-documented psychological predispositions, unsuited to objective assessment, of all the humans involved, including some scientists with the ear of public policy makers.

Comorbid conditions: diabetes, cardiovascular disease, chronic lung disease, immune deficiencies, and age. More: https://www.cdc.gov/coronavirus/2019-ncov/hcp/underlying-conditions.html

coronaviruses also can cause the common cold. SARS-CoV-2 is a coronavirus.

Reason and science

A rational response to a pandemic should be free of obvious mistakes of reasoning and be scientifically informed. Perhaps subtle mistakes and uninformed responses can be forgiven in the heat of the moment, but these moments must pass quickly. When they don't, negative consequences are compounded.

The response to the Covid-19 pandemic is a case in point and will likely be remembered as a fiasco of both misinformation and fallacious reasoning of historic proportions. The proper reaction to an infectious disease should be determined by the relative lethality of the disease and the measures taken in response. The lethality of a disease is measured *provisionally* by the *case fatality rate* (CFR), commonly expressed as a percentage, and calculated by dividing the number of deaths associated with the disease by the number of *known* cases of infection, obtained by testing, with the pathogen, in this case, a virus. The goal should be to do enough testing to get a CFR number closer to the ideal *infection fatality rate* (IFR) number: which includes, as denominator, the *actual* number of infected, *not merely those we know about.* The tested pool should be sufficiently large and diverse enough to be representative of the target population about whose vulnerability we wish to learn.[7]

As of March 3rd, the world average CFR for Covid-19 was 3.4%[8] It's been at various times and places calculated to be as high as 15% and at others in the same range, or approaching the rate for seasonal influenza at 0.1%. We will not have, until perhaps a year or more of data collection and analysis, a number as stable as we have for more familiar viral diseases.

> The CFR for an emerging disease like COVID-19 is remarkably hard to estimate accurately, simply because all the numbers involved are relatively small. A preliminary calculation from February 8, 2020 estimates CFR of about 1.4 percent—meaning out of 1,000 infected people, around 14 will die—but that's based only on cases from

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[7] We have this information, the IFR, for the common cold at a fraction of a percent, for influenza A virus subtype H5N1 at about 60%, for Rabies at near 100% (without treatment), and at 99% for Ebola (for which there is no current treatment).

[8] https://www.worldometers.info/coronavirus/coronavirus-death-rate/

> outside China, since the data from that nation's government has been unreliable.[9]

It is important to note that nearly all CFR numbers are, by definition, local estimates, local in time and geography. An ideal number would have as denominator in the formula (no. dead/ no. infected) *everyone* infected. That would make it an IFR. At best, testing a representative sample of the target population is the best we can do. And, in practice, up to now, for Covid-19 *we have not gotten even close to a representative sample of the target population.* (The target is all of those susceptible to being infected: humanity.) Given the dearth of testing and poor preparation responsible for it, we have only hints as to the true lethality of Covid-19. But they are trending downward.

There are reasons to believe the case fatality rate, the measure of lethality, for Covid-19 will be, when finally established, within the range of the seasonal influenza virus — perhaps only a bit higher, according to some authorities, but there is nothing yet to show that it will be "unlike anything we have seen before" — thus, calling for measures also "unlike anything we have seen before." Were it not for certain other eventualities, some expert voices, such as biostatistician Dr. Knut Wittkowski suggests, Covid-19 might easily have gone unnoticed this season except by all but a few epidemiologists focused on teasing out subtle differences in the respiratory infection death count.[10]

Here is what is normal:

> This season [2019-2020] CDC estimates that, as of mid-March, between 29,000 and 59,000 have died due to influenza illnesses [in the U.S. alone].[11]

On March 11th,

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[9] "Just how contagious is COVID-19? This chart puts it in perspective: Everything epidemiology can tell us about the new coronavirus," Matthew R. Francis, *Popular Science,* February 20, 2020.

[10] See interview link above and, also https://www.medrxiv.org/content/10.1101/2020.03.28.20036715v3.full.pdf

[11] https://www.health.com/condition/cold-flu-sinus/how-many-people-die-of-the-flu-every-year

> Anthony Fauci, MD, director of the National Institute of Allergy and Infectious Disease, put it plainly: “The seasonal flu that we deal with every year has a mortality of 0.1%,” he told the congressional panel, whereas coronavirus is “10 times more lethal than the seasonal flu,” per *STAT* news.[12]

Dr. John Ioannadis would say Fauci may be excused for exaggerating given his role as interface between biomedical science and the lay public and their very lay leaders, but his statement was not science. Ioannadis *would* say that if he was not notoriously diplomatic. Rather, he says, in effect, “we all make mistakes.” The tragedy is that some mistakes have deadly consequences.

“Herd Immunity” and other possible approaches

While most western countries have been following a clear “flatten-the-curve” path, there are two that have deviated: Sweden and Mexico.

We’ll see in the end how things go for these two countries. Their reasons are different and they have to deal with very different internal social and cultural conditions, and there are many, many other factors that may affect the outcome. But it should be interesting.

Various things may be driving the choices these two countries made.

Sweden

Sweden is determined to follow the herd immunity strategy (unless it’s changed very recently) in contrast to its neighbors, Norway and Denmark, which are doing flatten-the-curve. And Sweden has been heavily criticized for this.

From my reading (and personal experience with Swedish friends and those very familiar with the culture), I’ve learned the Swedes are very stubborn and extremely proud of their common sense. They are also community-driven. They are fine cooperating if the need for doing something is fully explained and seems sensible to them. Otherwise, they will deeply resent being forced to do something and will resist. (This is, of course, to deal in generalities and stereotypes, but it is not correct to assume that cultural tropes specific to geographies can be ignored without peril. Not in Sweden, not in Mexico, not in the U.S., not anywhere.) The Swedish health authorities must be credited with knowing their culture and knowing what will fly in Sweden and what will not. The only way they could convince their people to accept a lock down is if it appealed to their common sense. They weighed the pros and cons of the two strategies and the idea of a universal lock-down just did not make sense versus a targeted strategy of creating bubbles of disinfection around just those people who need that. The Swedes also think of themselves as pretty tough, and besides, they have an excellent care system that is not so bare-bones as that in other countries (such as Italy or the U.S.). The curve may be pretty steep but they think they can still handle it without artificially flattening it. And by doing so, they avoid all the negative consequences of a lock-down. That’s their theory.

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[12] https://www.health.com/condition/cold-flu-sinus/how-many-people-die-of-the-flu-every-year

Mexico

Mexico has been following an interesting plan in response to the virus similar to that of Sweden but a little different: a sort of hybrid herd-immunity/flatten-the-curve-plan. Up until recently, the last week or so, Mexico was being heavily criticized for seeming to do nothing in response, while everybody else was busy reacting.[13] Just as Sweden was, and is, accused of being irresponsible. But Mexico has a plan. It is to give time for herd immunity to get started, then only clamp down on restrictions once the death count reaches a certain number. Only at that point, would they come down hard with draconian restrictions, even, in some cases, more strict than in the U.S. I understand *all* public places, even parks, are officially closed at this time. The beaches are all closed. This clamp down happened very suddenly, though people had been warned it was coming. It was not phased in. One day everything was normal, the next dead. One day, there was dancing in the street; the next, the military is patrolling the streets.

Mexico’s situation is not that of a typical European nation, or the U. S. Their health officials knew that if they have to do a lock-down, they must do everything in their power to keep it as short as possible. That’s why they delayed it as long as possible, hoping to get herd immunity seeded before any lock-down. Unlike Sweden, their resources are limited, and do not have either a medical system to handle a sudden overload or the economic power to support large numbers of people if they cannot work. The alternative to work is extreme poverty, even starvation—not to mention all the other health problems that poverty would bring. The plan was to delay, then target their limited resources at just those high risk people early. I heard the threshold number was 100 dead.[14] That would trigger the lock-down. The plan is to lift the lockdown as soon as the death number peaks. The idea is the number of dead now, combined with knowledge of the mathematics of the curve, should allow some prediction of when the capacity of the medical system will be maxed out. Anticipating this event determines when the strategy inflection point occurs. Meanwhile, the prior seeding of herd immunity will minimize the steepness of future curves when the immediate lockdown is ended. The strategy is to make the duration of the lockdown(s) as surgically precise as the mathematics of the infection and the data permit: no sooner and no longer than necessary to keep the medical system from crashing.

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[13] As of this writing, it is being criticized, by critics, both internal and foreign, for extreme draconian measures.

Has either of these plans worked? It’s too soon (22 April 2020) to know .

In the case of Sweden, people outside of Sweden and some internal critics are saying it has failed because Sweden, at this point, has more dead (adjusting for population differences) than Norway or Denmark. Not a lot more, but more. But, of course, that is to be expected if you do the herd immunity thing. It’s important to note that the flat curve and the steep curve in the flatten-the-curve graphs still mean the same number of people get sick and die. The supposed virtue of the flat curve is that it spreads it out over a longer period of time. If you have excess medical capacity, like Sweden, you will be able to handle a lot more sick at once. But the peak will be short. It will not drag out. So it is not a surprise that Sweden is not now doing as well as its neighbors. The idea is, in the end, it won’t be any worse off than its neighbors and possibly better because it escaped the deaths and damage specifically associated with a lock-down which are in addition to any attributable to the virus.

Mexico? Again, too soon to tell. But there is one glaring fact: even when taking into account the population difference (330 million for the U.S. and 130 million for Mexico), which means that other things being equal (which they are not, of course), the U.S. death rate should be 2.5 times as high as Mexico's. It's not. Instead, it is 25 times as high! (as of 4/21/20 according to: the mortality analysis at Johns Hopkins: https://coronavirus.jhu.edu/data/mortality) This requires explanation.

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[14] I’m not clear, at this point, what the exact threshold number is.

The Mexican press, of course, has noticed. Even the *New York Times* has noticed.

There are a number of possible explanations—or, probably, some combination—from among the following:

1. Geography - a huge proportion of the Mexican population is concentrated in one place: Mexico City. Much of the rest of Mexico is sparsely populated compared to the U.S. Almost all early cases of the disease were in the capital city and traceable to one incident involving an upper class group returning from a ski vacation in Vail, Colorado in early February. They were quickly spotted and contained. Did this quick early containment explain it? It seems highly unlikely because the border between Mexico and the U.S. is the most heavily crossed land border in the world. There were vast opportunities for the virus to cross. Chances are, it crossed and was spreading much earlier.
2. Demography - the Mexican median age is much younger than that of the U.S. (while that of the U.S. is much younger than that of northern Italy). There is evidence this is indeed a significant factor.
3. Climate - there have been suggestions that this virus (unlike many U.S. and Canadian tourists) doesn't like the climate of Mexico. Neither did it like that of southern Italy, or the southern Mediterranean, including Greece... Weak science on this, though.
4. Genetics - there have been vague suggestions that certain ethnic and racial groups are less susceptible to a given virus than others. This virus may not like the dose of indigenous genes in the Mexican population. Some viruses have been known to specialize in some genetic profiles and not others. Weak science on this, though. (For contrast, the 2009 "Swine flu" actually started in Mexico.)
5. Culture - the average Mexican doesn't travel much outside the country compared to the average European or American, at least not for tourism. But see 1.
6. "The worst is yet to come, just wait…" - Mexico got its first deaths almost a month after the U.S. This might account for a delayed curve, but even taking that into account, it doesn't seem to be accelerating as much as it was at a comparable point on the U.S. curve. The huge difference in the ratio of deaths is holding pretty steady even as the

numbers go up. (Earlier in April, the death rate in Mexico was 38 times lower per 100,000 population than in the U.S.) **[UPDATE: as of 4/29/20 Mexico's curve is starting to flatten while never having reached the per 100,000 mortality rate of the U.S. and their medical system system has not, so far, exceeded 50% capacity even in the worst hit place, Mexico City.]**

7. Sheer luck - possible… but the contrast between the U.S. and Mexico is pretty stunning. It's like one of the *most* affected countries in the world shares a long, extremely porous border with one of the *least* affected countries.
8. Early efforts at herd immunity - ???

Other interesting facts. Besides their recent experience with the Swine Flu from which they have learned much, Mexico has generally good relations with China, and Mexican doctors and researchers were in Wuhan working with the Chinese well before there were any cases in North America. They began planning a strategy long before it seems to have been taken seriously here. And China has been actively courting good will in Latin America: https://www.reuters.com/article/us-health-coronavirus-mexico-china/thank-you-china-mexico-grateful-for-coronavirus-medical-supplies-idUSKBN21J6U5

Logically possible strategies:

1. flatten the curve
2. herd immunity
3. both at once
4. first flatten, then herd
5. first herd, then flatten

The first two have been widely discussed.

The third can be eliminated because it is patently counterproductive. One strategy actively spreads the disease, the other tries to contain it. You can't do both at once… at the same time in the same place.

The fourth is a disaster: after having preserved vulnerability in everyone you now expose everyone. ***Update (10/18/20): the fear is that Norway,***

New Zealand, for example, may (unintentionally) be headed toward something like this.

But the fifth strategy is intriguing and seems to be what Mexico is up to. I don't know of any other country trying to do the same. ***Update (10/18/20): in hindsight, whether Mexico was/is doing this is unclear. But results of recent mathematical disease modeling by Prof. Karl Friston seems to support this approach.***

What is interesting is the strategies taken *in this order*—first herd, then flatten—do have a certain logic. Suppose you start by letting the virus run wild. If a virus doesn't kill everyone it touches, it will pass through a population leaving a lot of immunity behind. But it will inevitably alight on those vulnerable to lethal consequences. It's not possible to prevent some deaths. There is no population that has no health-compromised people (outside some colony of health freaks). But when a certain number of deaths is reached, at that point, you clamp down hard with restrictions and lockdowns. It has already spread enough to begin to show its lethality. But because the time between infection and death for those who are going to die is about one to two weeks, you know the infection has already begun its exponential rise and those "vulnerables" infected two weeks ago are going to start stressing your medical preparedness (ICU capacity, ventilator supply, etc.). That "certain" number, the threshold number that triggers a radical switch in strategies will be determined by what you know of your capacity and preparedness. From the number you see now of those who are vulnerable you can estimate how many more you can expect shortly. When that projected estimate, based on current numbers and the mathematics of this virus' past behavior, matches your medical system's capacity, that's when you clamp down hard. And only for as long as absolutely necessary to maintain medical need below medical capacity.

This hybrid strategy deliberately encourages herd immunity up to the point that it threatens to push the curve beyond the capacity of your medical system, which is going to vary from country to country. As soon as the hospitalized pass through the system, you are ready for the next batch, so you open up and let herd immunization continue. And if herd immunity worked, you should not see such a huge influx again. Or, at least, can hope to manage it. All the while keeping society going as much as possible.

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See also “Covid-19 Part 2: virus v. world” which explores ethical, social and political questions generated by this virus and the reaction to it.

More resources

On the Media | A Model Scapegoat (podcast)

“The ways we live our lives now — most of us, anyway — is to some degree or another predicated by epidemiological models: projections of best-case, worst-case, and most-likely outcomes based on tons of historical data, rapidly increasing current data and the science of virology. It *is* science. It is also subject to change, as society adjusts and the pandemic unfolds. Several prominent epidemiological projections and models have in recent weeks re-evaluated, usually to foretell fewer deaths than in previous iterations. In this segment, Politico’s David Siders tells Bob how these changes have led to both good-faith skepticism and partisan furor, especially from President Trump's favorite media personalities. *This is a segment from our April 17, 2020 program, Model Behavior.*”

On the Media | Going Up And Down The Curve (podcast)

“Since the coronavirus pandemic began, we’ve all enlisted in the global effort to ‘flatten the curve.’ It’s a nod to the physical curve plotted on a chart of disease spread: by compressing the disease’s natural transmission through social distancing, we can effectively prevent the saturation of the healthcare system and save countless lives. But for all our emphasis on curves, we rarely consider what goes into modeling. How are we to interpret and abide by the projections that now shape our day-to-day lives?

Josh Epstein, professor of epidemiology at NYU’s School of Global Public Health and director of the NYU Agent-Based Modeling Lab, is a veteran at navigating the thorny realm of infectious disease modeling. In Politico, Epstein recently warned that there’s another curve we should be paying attention to as we map the spread of coronavirus: the curve of fear.” *This segment is from our April 17th, 2020 program, Model Behavior.*

UPDATE

Herd Immunity the only Covid-19 strategy that works? Mallen Baker suggests that a *failed* lockdown might work, too.

Appendix

These are the opening two paragraphs from a classic 19th Century essay in the history of epistemology. It calls attention to the fact that inquiry—*certainly any inquiry with scientific pretensions*—is under an imperative to seek out evidence to undermine whatever conclusions it is momentarily burdened with. This imperative is not merely ethical but epistemic. It is mandated by the principled investigation of experience: which is what distinguishes "the scientific." You are *not* doing science if you do not take this imperative seriously. Thus, Prof. John Ioannadis insists in his interviews cited above that science is "self-correcting." It is *always* in the business of self-correcting. There is not going to be a *final* correction, not until the practice of science comes to an end with its practitioners.

> ### I. THE DUTY OF INQUIRY
>
> A shipowner was about to send to sea an emigrant-ship. He knew that she was old, and not overwell built at the first; that she had seen many seas and climes, and often had needed repairs. Doubts had been suggested to him that possibly she was not seaworthy. These doubts preyed upon his mind, and made him unhappy; he thought that perhaps he ought to have her thoroughly overhauled and and refitted, even though this should put him at great expense. Before the ship sailed, however, he succeeded in overcoming these melancholy reflections. He said to himself that she had gone safely through so many voyages and weathered so many storms that it was idle to suppose she would not come safely home from this trip also. He would put his trust in Providence, which could hardly fail to protect all these unhappy families that were leaving their fatherland to seek for better times elsewhere. He would dismiss from his mind all ungenerous suspicions about the honesty of builders and contractors. In such

> ways he acquired a sincere and comfortable conviction that his vessel was thoroughly safe and seaworthy; he watched her departure with a light heart, and benevolent wishes for the success of the exiles in their strange new home that was to be; and he got his insurance-money when she went down in mid-ocean and told no tales.
>
> What shall we say of him? Surely this, that he was verily guilty of the death of those men. It is admitted that he did sincerely believe in the soundness of his ship; but the sincerity of his conviction can in no wise help him, because *he had no right to believe on such evidence as was before him.* He had acquired his belief not by honestly earning it in patient investigation, but by stifling his doubts. And although in the end he may have felt so sure about it that he could not think otherwise, yet inasmuch as he had knowingly and willingly worked himself into that frame of mind, he must be held responsible for it.

From "The Ethics of Belief." by William K. Clifford. Originally published in *Contemporary Review*, 1877. Reprinted in *Lectures and Essays* (1879).

…

The virus

The purpose of the lockdown/social distancing/masks strategy is to stop the spread of the SARS-COV-2, the virus that causes the respiratory disease Covid-19. It does not directly stop people from being infected. The goal was always to reduce the rate of lethality due to strained medical resources from as a result of uncontrolled spikes in the infection numbers. The idea was fewer people would die if the spikes were controlled. The containment strategy was a tool for effecting this. It was not a cure nor a treatment for the disease itself. The same numbers of people would be infected, sooner or later, whether the strategy was strictly adhered to as would be the case if no containment strategy at all was imposed or if the imposed one failed to accomplish its end. The infection curve would be flattened, but the area under the curve would remain the same (barring a vaccine).

CFR / IFR difference

‘To refresh your memory: the “case fatality rate”, CFR, of a disease is the number of deaths divided by the number of *confirmed cases*. The “infection fatality rate”, IFR, is the number of deaths divided by the number of *actual infections.* So if 10,000 people get a disease, and you detect 1,000 of them with testing, and then 100 of them die, then your CFR is 10% (100/1000) but your IFR is 1% (100/10,000). Your CFR is dependent on how many people you are testing; the IFR is not, or at least not directly.’ — from https://unherd.com/2020/09/has-covid-become-less-dangerous/?tl_inbound=1&tl_groups[0]=18743&tl_period_type=3